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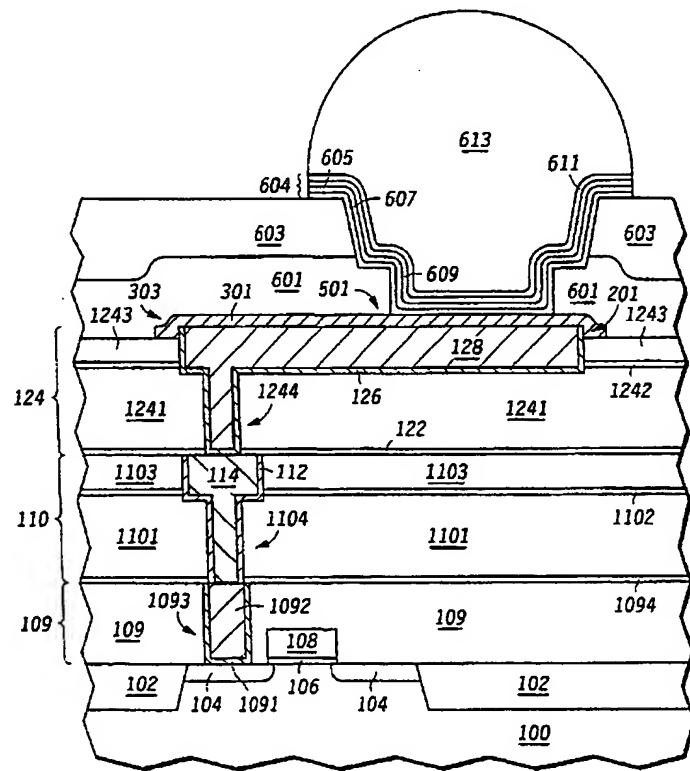
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[Continued on next page]

(54) Title: SEMICONDUCTOR DEVICE AND METHOD OF FORMATION



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(57) Abstract: A semiconductor device and its method of formation are disclosed wherein a surface of a semiconductor substrate is planarized to form an interconnect (1244) within a dielectric layer (1243). The top surface of the dielectric layer is then recessed with respect to a top surface of the interconnect to form a step (201). An opaque film (301) is then deposited over the surface of the semiconductor substrate. The opaque film (301) is lithographically patterned and etched, wherein an alignment of the patterning layer (401) is accomplished using topographically discernable features (303) that are formed in the opaque film (301) in regions where the step (201) between the interconnect (1244) and dielectric layer (1243) is produced.



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B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT
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Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 863 825 A (OSUGI RICHARD ET AL) 26 January 1999 (1999-01-26) column 2, line 42 -column 3, line 14 column 3, line 48 -column 4, line 5; figures 2,5,6 ---	1,5
X A	WO 99 08314 A (OKAMOTO YOSHIHIKO ;HITACHI LTD (JP)) 18 February 1999 (1999-02-18) abstract page 20, line 24 -page 22, line 16 page 23, line 22 -page 24, line 13 page 25, line 10 -page 26, line 22 page 33, line 23 -page 36, line 9 page 40, line 24 -page 45, line 17 page 52, line 22 -page 54, line 14; figures 9-13,18-21,23-26,33-41,48-58,76-81 --- -/--	1 2-4,6-10

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Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 020 263 A (YU CHEN-HUA ET AL) 1 February 2000 (2000-02-01)	1
A	column 3, line 64 -column 5, line 43; claim 1; figures 7AB,8,9 -----	5,9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/20947

Patent document cited in search report	Publication date		Patent family member(s)	Publication date
US 5863825	A 26-01-1999	JP	11186162 A	09-07-1999
WO 9908314	A 18-02-1999	WO	9908314 A1	18-02-1999
US 6020263	A 01-02-2000	NONE		